

VIRGINIA WILDLIFE

NOVEMBER 1987

ONE DOLLAR



VIRGINIA'S WHITETAILS

VIRGINIA WILDLIFE

When Virginia began deer checking stations in 1947, the total harvest was 4,011. By the end of the most recent 1986 season that figure had grown to a whopping 121,801. A few thousand more can be added annually from losses resulting from crop damage, auto collisions and disease die-offs and, still, deer numbers continue to expand in many areas. Such numbers of deer were unknown in colonial times and this phenomenal growth did *not* come about by accident.

Most state fish and wildlife agencies were formed just after the turn of this century in an effort to improve wildlife numbers which had been depleted by uncontrolled habitat destruction and market hunting. With the support of sportsmen and concerned conservation groups, wildlife protection programs were set in motion. Sadly, however, funds derived solely from sportsman license fees barely provided for basic enforcement of wildlife laws. Little, if any money was available for habitat improvement, research, wildlife stocking or land acquisition.

In September of this year, the nation's sportsmen celebrated the 50th anniversary of the Federal Aid in Wildlife Restoration Act, a state-federal cooperative program supported by a federal excise tax on sporting arms and ammunition. More commonly known as the Pittman-Robertson or "P-R" Act, the sportsman-funded program provided the states with the needed funds to begin wildlife restoration programs without resorting to general tax revenues.

One of the most successful of the "P-R funded" wildlife management stories has been the impressive return of the white-tailed deer. Faced with near extinction when the Virginia Game Department was formed in 1916, white-tailed deer are now commonplace in most areas. Although much has been learned about managing deer populations over the last 50 years, little would have been possible without sportsman support for those efforts. On occasion, that support surely required more than a full measure of trust! The thought of hunting an animal which had been protected for so long was difficult for many sportsmen, and if "bucks only" hunting wasn't bad enough, those darn biologists were soon talking about hunting *doe* deer.

Department biologists, game wardens and many hunt clubs now know that hunting bucks only or failure to take a adequate number of doe deer places too much strain on the buck segment of the population, resulting in too few trophy bucks and an overpopulation of doe deer. But, it is possible for anyone to improve deer conditions if they are willing to adopt some basic deer management principles, keep a few simple records and exercise patience.

The series of articles that follow illustrate what we have learned and what we are doing to provide for quality deer management. With the proper application of the knowledge we have gained, we can help ensure that future Virginians will have healthy numbers of whitetails to enjoy. It is to that end that this issue of *Virginia Wildlife* is dedicated.

Jack Raybourne
Chief, Division of Game

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VIRGINIA'S WHITETAILS

Most of us have seen them shadowed on the dark side of a field at dusk, or standing, twitching their ears behind some small dogwood in the summer. By fall, they vanish in a gray November fog, and we wait for them silently in our tree stands, waiting for them to ease out of the mist and stop frozen, staring at us with racks we've only seen pictures of.

But we don't often think about how much thought goes into taking care of the species. Our wildlife biologists, though, are particularly fussy about the whitetail. Perhaps it's because we nearly lost the whole darn population of them not too long ago, and our wildlife biologists are now bound and determined to keep the animal alive and well in this state. But, wildlife management is not easy. It may look easy, when we reel off our recommendations for seasons and bag limits and doe days by county every two years. But, an awful lot goes into it.

So in this issue, in the hopes of revealing some of the hard thinking that goes into the maintenance of healthy whitetails in Virginia, our biologists have taken words to paper, to explain what they do, and why they do it—to keep deer tracks in our woods.

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White-tailed deer in velvet; photo by William S. Lea.

Back cover: White-tailed doe; photo by Roy Edwards

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VIRGINIA'S WHITETAILS

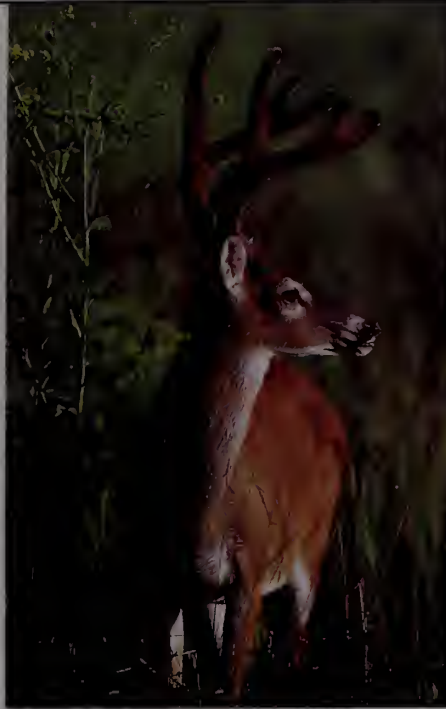
Despite the old adage, "Never look a gift horse in the mouth," that is the first thing a wildlife biologist does when he runs a check station in the fall in order to collect data on the health of a deer herd. Sounds crazy, but it's tame compared to the response a biologist gets when he tells "buck hunters" that in order to have more bucks to hunt, they need to shoot more does. Wildlife management can be a puzzling science, to put it mildly.

But, if you're in the business of maintaining healthy wildlife populations, you find yourself doing a lot of things that seem strange to a lot of people. However, once you understand the basic principles of wildlife management, you'll see how all these "crazy" pieces of information fit together to form an invaluable picture of a wildlife population. That picture is what we use to make our management recommendations.

Thus, the purpose of this article is to provide you with an overview of the Game Department's deer management program, by explaining how we collect and use deer data to manage whitetails in the Old Dominion. We'll discuss some harvest strategies and some of the principles of deer herd management and offer a few suggestions as to what you as an individual deer hunter might do to improve your sport.

But, first, it might be helpful to take a quick look back to see how we got to the point of having to look our deer in the mouth.

Historical accounts indicate an abundance of white-tailed deer in Colonial Virginia. Between the years 1698 and 1715, approximately 14,000 deer hides were exported annually and concern



by Bob Duncan
Assistant Chief
Game Division

for year-round harvest resulted in the General Assembly passing legislation in 1699 which prohibited deer hunting from February 1 through July 31. Still, by the early 1900's the deer herds in the mountains of Virginia were nearing extinction.

Concern over declining wildlife populations resulted in the establishment of the Game Department in 1916. Early efforts were aimed at protecting the remaining deer since estimates for the annual deer harvest during the 1920's averaged only 619 deer for the 33 counties open.

Obviously, one of the highest priorities of the Department at that time was to restore deer numbers, especially in the western part of the state. Early records of deer stocking are incomplete; however, deer were imported from as far away as Wisconsin, Michigan, Pennsylvania, North Carolina and Alabama, from 1930 to 1950. From the 1950's until the late 70's, deer were live-captured and relocated throughout the state. The majority of management effort in those "early days" went into restocking and protecting those initial herds.

As a result of those early efforts, whitetails in the Commonwealth now number an estimated 600,000 out of approximately 14 million nationwide. A recent survey found that deer are the most popular species among hunters and that deer hunting is increasing in popularity faster than any other form of hunting.

Virginia deer hunters are no exception to that national trend when it comes to their devotion to the number one big game animal. Approximately 86% of all licensed hunters in Virginia hunt deer, and more than one-half of

Opposite: photo by Tim Black

all the days spent hunting each year in the Old Dominion are spent in pursuit of the whitetail. Our deer harvest places Virginia in the top dozen states in the country and hunter success continues to increase, with a deer hunter success rate of 38.6% last season.

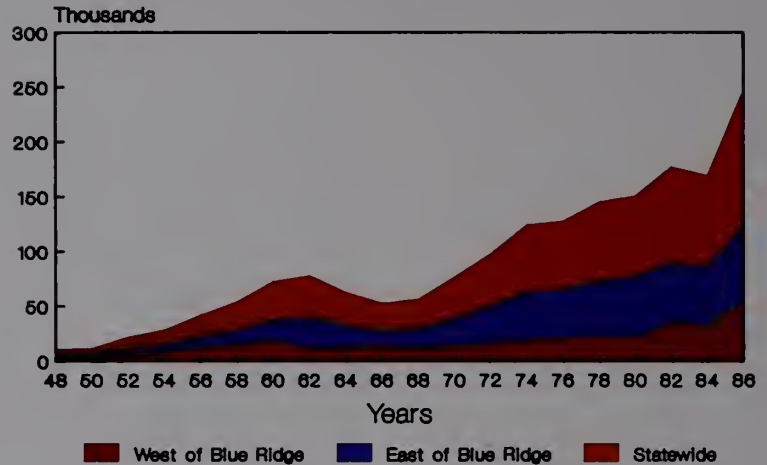
With a few local exceptions, the challenge of managing deer in modern day Virginia has shifted almost completely from establishing deer herds to the question of controlling deer numbers and providing for improved quality. Thus, today there are two major goals of deer management set by the Game Department. The first is to provide as much deer hunting opportunity as possible without harming the resource, and the second is to provide for population control necessary for herd health and reduced crop damage.

The cornerstone of the Virginia deer management program is a checking system that allows the Department to monitor the annual reported harvest. The mandatory checking system for big game was established in 1947 and has continued through the present day, thanks to the services of some 1,300 volunteer check station operators, who have become a valuable part of the deer management program in Virginia.

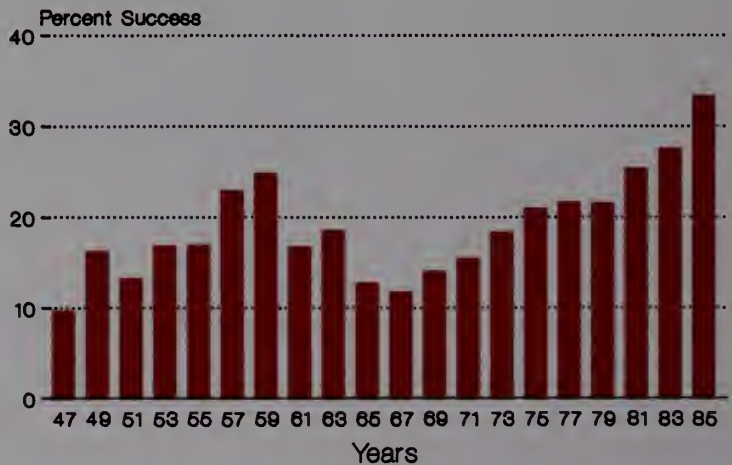
In addition to the standard data supplied by the big game check card (county of kill, sex of deer, type of license, weapon and class of land, etc.), game division personnel collect additional deer data at approximately 40 selected checking stations across the state. These special stations give our technical personnel the opportunity to collect biological information needed for management. Specifically, carcass weights, the age of the deer based on tooth replacement and wear, sex of the animal, antler development, reproductive status for does and general condition are recorded. Department technical personnel examine approximately 6,900 individual animals each year during the season, amounting to about a 5½% sample of the total reported harvest.

Elsewhere in this issue, Jack Gwynn, with many years of deer management experience, explains the abomasal parasite counts which, besides check station reports, are a standard part of deer

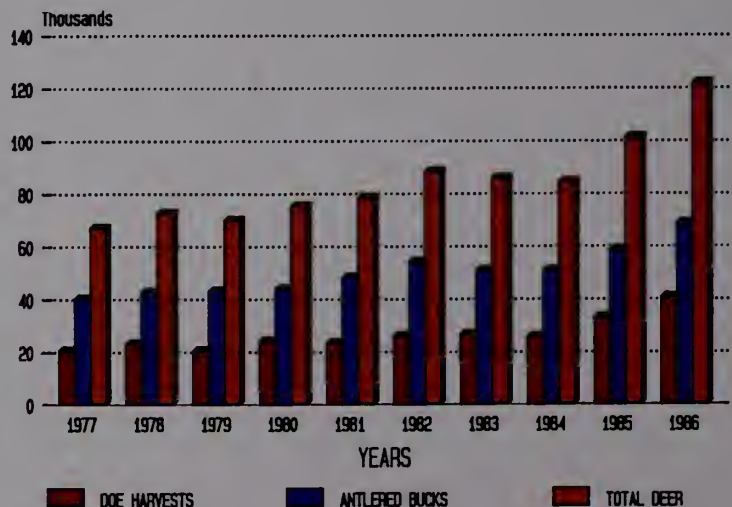
VIRGINIA DEER HARVEST 1948 through 1986



DEER HUNTER SUCCESS



DOE AND BUCK HARVEST



herd health checks. These stomach worm counts provide indirect evidence as to the nature of the quality of the deer habitat. The findings of these health checks provide supporting data which usually confirms other observations. Deer herds which are sampled and found to have exceedingly high stomach worm counts, usually also have other indications of over-population and many areas with these symptoms have actually experienced die-offs, usually through disease outbreaks.

Too many deer in an area results in decreasing body size, increasing numbers of yearling bucks with spikes, and reduced reproduction. Usually, these conditions evoke complaints from hunters about inbreeding or poor genetic stock, although more and more informed deer hunters are coming to understand the inverse relationship between deer numbers and quality. To be sure, genetics play a role, but basically, deer are what they eat!

In fact, much of what has been said or written about the role of genetics has been misunderstood. Genetics do play a role, especially in terms of the characteristics of antler conformation, including oddities such as drop points, forked tines and other nontypical points. But, the idea that a buck, once a spike, will always remain a spike, simply is not true. Take the yearling spike that was tagged at Radford Arsenal two years ago which was subsequently harvested as a 7-point the next season. Contrary to common hunting camp opinion, not all yearlings have spikes as their first set of antlers. In fact, given a diet with sufficient protein, yearling bucks should have antlers which are anything but spikes.

Thus, an increase in the number of yearling bucks with spike antlers is a symptom of too many deer for the food supply. Similarly, a decline in the average hog-dressed weight of yearling bucks is another good indication of overpopulation. With does, overpopulation or crowding results in lower body weights, reduced reproductive rates and poor fawn survival.

Despite notions to the contrary, "Mother Nature" has some pretty harsh methods for dealing with overpopulation of animals, especially deer,

which have a great capacity to literally eat themselves out of house and home. Starvation losses during the winter usually occur in more northern states, although dead deer, which were believed to have died from malnutrition, have been found in non-hunted areas in Virginia. Disease outbreaks are more commonly the cause of mortality in whitetails in the southeastern U.S., with the most common being hemorrhagic disease, a viral disease discussed in detail in Jim Bowman's article on parasites and disease.

Normally, however, neither disease nor starvation results in the loss of all deer in an area. Some animals usually survive, and when the habitat has recovered from over-browsing, the remaining deer will replenish the population.

One of the fundamentals of deer hunting and game management is to take the boom or bust, feast or famine fluctuations out of the picture and provide for herd health and production on a sustained yield basis. The key to this is to harvest enough of both bucks and does to keep the herd at carrying capacity, which is the number of deer that can be supported in a healthy condition without damage to the habitat.

Regional biologist Mack Walls has written about the Radford Arsenal Deer Hunting Program which the Game Division administers. For years, district biologist Al Guthrie and his personnel captured deer there for stocking in other areas. Some bucks were taken with most shipments, but the emphasis was on removing does from the powder plant. As a result of removing both sexes of deer, the plant herd was generally held in "balance" with the carrying capacity of the range and quality deer, and a favorable buck to doe ratio has been maintained.

Unlike most areas where hunting pressure is high for bucks, Radford bucks survive to old age classes. One buck taken during the 1985 season at Radford was an 8½-year-old granddaddy of a buck with a 10-point headress! The largest taken that same year was a 15-point that tipped the scales at 231 pounds and aged at 6½ years! Another 6½-year-old, carried an 18-point rack with a total body weight of 177 pounds.

In fact, three out of every five bucks taken at Radford in 1985 were 8, 9, or 10-pointers!

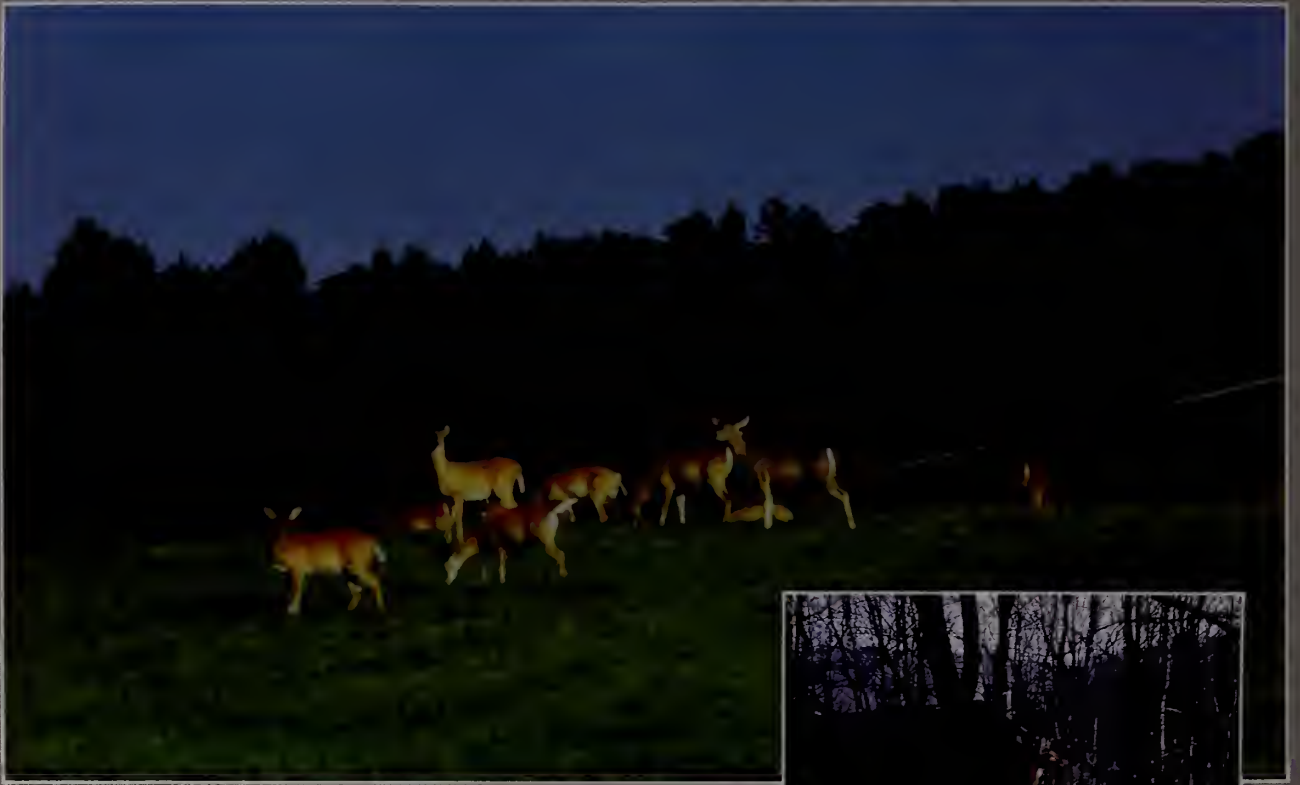
Even though drought conditions in 1986 reduced habitat quality, four Radford bucks that year hit the scales at over 200 pounds apiece. These included a 6½ year old at 234 pounds, a 5½-year-old at 220 pounds, a 4½-year-old at 228 pounds, and a 3½-year-old at 220 pounds. When is the last time you or a hunt club member killed a buck of this size or age?

While it is not practical for the Department to set regulations to manage for trophy bucks statewide, it is the intent of our regulations to provide for herd health. Keeping a herd within the carrying capacity of the land is the absolute first step toward quality deer management. Harvesting a sufficient number of antlerless deer will greatly improve the sex ratio of a herd and the quality as well.

Although the Department establishes hunting regulations on a two year basis, Game Division personnel collect deer data every year. This data becomes the basis for analyzing the status of a herd and provide indications as to any changes needed in harvest regulations. By looking at check station data, deer damage, habitat conditions, and parasite counts, the management prescription becomes clear.

Generally, the Game Department manages deer on a county by county basis. Whether by county or by deer management unit, the Department is necessarily concerned with the overall picture for the county, the region and the entire state. Game Division biologists meet to discuss preliminary hunting season recommendations, then meet with other department personnel statewide to discuss proposals. A final Game Division staff meeting is held to complete recommendations to the Department's Board. The meetings are held in the odd numbered years and generally the first proposal hearing is held in March. Following a public notice procedure, a second meeting for the adoption of game regulations is held, usually in late April or early May.

Basically, seasonal deer bag limits are employed to provide for an equitable distribution of the harvest; how-



Our Virginia herds of whitetails have come back from near extirpation in the early 1900's, to the greatest abundance ever known, largely through the work of the Game Department's restocking efforts, changes in land use, and sportsmens' respect for hunting regulations; Department staff photos.



ever, since areas differ in capacity to support deer, the bag limit is adjusted accordingly. This can range from the one per year (bucks only) regulations in southwestern counties to three per license year (one of which must be an antlerless deer) in the soybean and peanut country of southeastern Virginia.

This past year, deer season regulations were changed in 18 counties, 13 of which received increases or liberalizations of some type. Changes include an increase in the season bag limit (from two to three); an increase in the number of either sex deer hunting days; or a combination of these two. Five counties were given more restrictive regulations to provide for deer herd increases.

Other types of regulation changes, like adding either-sex deer hunting days to the muzzle loading season, or adding bonus deer for archers via a special archery season license, are examples of providing additional recreation without adversely impacting the resource. Blackpowder shooters harvest less than 1% of statewide kill and bowhunters account for 6½%.

The number of either-sex deer hunting days is the most important management tool at the disposal of the Department. It is the regulatory throttle used to increase or decrease the harvest as needed.

In fact, in many cases, the failure to harvest an adequate number of does has placed a tremendous pressure on the buck segment of the population. For example, in 1986, 54% of the Vir-

ginia buck harvest was comprised of yearling bucks. Almost 75% of the bucks in either-sex deer counties are yearlings or fawns. Occasionally an older buck will survive, but rarely in areas with extremely high hunting pressure. The lopsided sex ratio that results has a definite bearing on the following year's population.

Couple the legal over-harvest of bucks with the hunter reluctance to shoot does, and you can see that it is almost as difficult to keep a deer herd sex ratio balanced as it is to keep the bluegills from stunting in your pond! The solution in both cases is judicious harvest of the surplus. With deer, that means harvesting bucks and does.

While over-harvest can occur, this is generally not a problem. Hunting pres-

sure in areas with few deer tends to drop off when the point of too much effort to harvest too few deer is approached. On the other hand, efforts to increase deer numbers beyond recommended levels may be extremely counterproductive. In managing deer, it is as important to know what not to do as well as what to do!

With the exception of special regulations for Department-owned or cooperatively managed public hunting lands, it is not practical to establish separate regulations for different areas within the same county. Since most of the land in Virginia is in private ownership, the Department's only option is to provide for regulations which, if used to full advantage by Virginia sportsmen, will help to keep the white-tail in health and abundance.

This is where you as an informed sportsman can make a difference. By learning what to look for and observing conditions in your area, you will be in a better position to make harvest decisions about deer on the property where you hunt.

There are several things you can do to improve your deer hunting. First, if you or your club is not already keeping harvest records on your deer, then start! Invest in a set of reliable scales and weigh your deer and keep records on the beam diameter of the yearling bucks you harvest. Trend data recorded over several years can give you an excellent indication of any progress in producing better quality deer. A sample form is provided in this issue to assist you in getting started this season. If you do not know how to age deer, contact your local biologist and obtain a deer aging reference sheet or save deer jawbones and let a Game Division biologist age these for you. You will find Department personnel willing and able to assist you with your deer management program. Assist the Department by watching for disease and report any unusual problems like dead deer or sloughing hooves.

When it comes to harvesting additional branched antlered bucks during the season, passing (up) the buck, can be a self-imposed restriction which can make for better deer hunting in future years in your area. It is not unlike

throwing back medium-sized bass to increase your chances of taking a trophy later. Unfortunately, this idea has not yet gained as much acceptance among deer hunters as it has with bass fishermen, but the principle is the same!

However, even with the herd kept in "balance" with the range, there are many areas now which have a sex ratio imbalance and too few bucks in the older age classes. Since antlered bucks are the most sought after individuals in the populations, you, as an individual deer hunter or member of a hunt club, may wish to consider several management options.

Keep in mind that maintaining a herd at or slightly below the carrying capacity means that there may not be as many deer as you or I or other deer hunters would like to see. But, you are not likely to be satisfied with the results in the quality department if you do not limit quantity. Another factor is that the number of antlered bucks in a herd is not unlimited and expectations about the number of antlered bucks that can be produced or harvested should be tempered with the fact that the statewide antlered buck harvest averages 2.68 per square mile of forested range. The total deer kill per square mile of forest range averages 4.75 deer. While there are Virginia areas with extreme overpopulations of deer, an average number of deer across the state would be more like one deer per 20 acres.

Consider a "slot limit" on antlered bucks which grants protection to younger age class bucks sporting small 4, 6, and 8-point racks. These medium-sized bucks have the potential to develop given a couple of years growth. Feeding trials with captive deer have demonstrated that skeletal growth takes precedence over antler development in the first several years of a buck's life and most bucks do not obtain maximum size until reaching $4\frac{1}{2}$ to $6\frac{1}{2}$ years of age.

As mentioned earlier, most bucks do not survive long enough to reach their potential. Under a slot limit, truly large bucks should be harvested and, if there is a good buck to doe ratio, there is no problem with taking spikes. A deer club in one southwestern state

adopted a policy of not shooting branched antlered bucks on 25% of their property per season. They divided their hunting ground into four compartments and hunted branched antlered bucks in three of the four zones per season. They harvested does and spike bucks in every compartment. The zone where branched antlered bucks were conserved was rotated to a new zone every year. After three or four years, the club had dramatically increased the quality of antlered bucks taken on their property. Although they were not in a region of their state noted for big bucks, they increased the average antler beam diameter of their bucks to a level comparable to the best trophy area in their state. Their plan focused on harvesting enough deer to maintain good habitat and at the same time permitted more bucks to reach older age classes needed for the development of larger racks. Deer hunters can make a difference, but it takes time and commitment. Herds do not get out of balance in one or two seasons of hunting, and it may take four or five years to see the benefits of any changes.

Each year, much is said and written about our most popular big game animal. In this article, we have reviewed the basic principles that are used by our biologists in making deer management recommendations in Virginia. In the following articles in this issue, other Department biologists discuss further the different factors that are considered in managing our deer resources. Learn what to plant for deer in an article written by our wildlife forester, Jerry Sims, and see what Biologist Mack Walls has to say about the trophy herd at Radford Arsenal. Read Joe Coggin's review of deer research and consider what Don Schwab has written about deer damage to both crops and cars. Jim Bowman and Jack Gwynn take a much closer look at disease and parasites and what these mean in managing deer.

Hopefully, this issue will help clear up some of the mystery and "hocus pocus" feeling about wildlife management. It is a science, but it involves choices and decisions. Hopefully, we will be able to show you why. □



VIRGINIA'S WHITETAILS

White-tailed deer are likely to be found anywhere in Virginia. They are found in the mature forests, throughout the open farm lands, and even in suburbia. When given protection from poaching and free ranging house dogs, they seem to multiply and occupy just about any suitable thicket within a wide range of habitats. They are adaptable to changing conditions, and they have shown an amazing ability to coexist and even thrive adjacent to man's development.

Even though the whitetail will often multiply and do quite well on its own, we know that with proper habitat management they can do even better. We know that if we can improve the habitat, we increase the "carrying capacity" or the number and quality of deer the land is able to support. Simply put, improve the habitat and one can grow more deer with larger racks every year!

In order to improve habitat for deer, it is important to consider their year-round requirements, not just requirements during the few weeks of hunting season. It also involves consideration for the turkeys, squirrels, songbirds, and other animals that share the woods with the deer, since habitat development beneficial to one frequently can serve the others well.

The white-tailed deer is often called a selective browser; however, its diet consists of more than the buds, twigs, and leaves that we call browse. In addition, its diet is composed of a wide array of mast and herbaceous materials, mushrooms, and agricultural crops.

Water requirements for the white-tailed deer are partially supplied by the succulent plants which comprise a large part of its diet. During much of



by Jerry Sims
Wildlife Forester

Opposite: photo by William S. Lea

the year, its watering requirements are minimal; however, sources of water should be maintained. A source of water should never be farther than one half mile away. If water is lacking, ponds, or waterholes should be developed.

Food studies show a wide variety of foods are utilized in different areas. During the fall and the winter, their preferred diet consists of mast, evergreen browse, and agricultural crops when available. Preferred soft mast includes dogwood berries, wild grapes and other fleshy fruits. Acorns are a preferred hard mast and a high value food. Where these are available in quantity, deer are able to rapidly gain weight and store body fat prior to winter. Mast crops, however, are highly variable. It is not uncommon to have a total failure of acorns and other mast. Fortunately, the white-tailed deer has evolved into an animal with an adaptable diet and can find alternative food sources during the fall and winter of an acorn failure. Deer are also known to survive and even thrive in areas lacking abundant mast which have alternate food sources.

Evergreen browse from honeysuckle, greenbrier, laurel and rhododendron is another important food source during fall and winter. These foods are more nutritious during this time of the year than the hardened-off stems and twigs and dry leaves from hardwood shrubs and trees.

New spring growth of shrubs and trees, however, result in nutritious browse and forage. Then, the deer's diet consists of this tender new growth, fruits, soft mast, and fungi. As the new growth hardens through the summer, the whitetail seeks browse off the current annual growth of woody plants, herbaceous material, fungi and fruits.

The body weight and size of a buck's antlers are related to the abundance and quality of food that is available. A yearling buck from a rocky ridge in the deep woods of the mountains may

only have spike antlers and dress out at 85 pounds, while his corn-fed cousin in the valley may sport a 6-point rack and weigh in at 100 pounds. A deer is what he eats; thus, habitat improvement increases the carrying capacity of the land and improves hunting.

Increase the available food in an area, and deer will be attracted to it. They will not come running from miles away, but where their home range comes close to good habitat, they just might move in and stay for hunting season. More importantly, the doe that winters on a property with an abundance of food is more likely to produce healthy twin or triplet fawns the following spring.

Agricultural crops are a highly utilized food source during a large portion of the year. Where available, deer enjoy a wide variety of cultivated crops such as corn, small grains, pasture, and soybeans. Supplemental plantings of agricultural crops are often used to increase the carrying capacity of the land. They are also used to attract deer and concentrate them for harvest.

The Mississippi Department of Wildlife Conservation conducted a study in 1984 to investigate the value of food plots for deer in the Southeast. Responses from the questionnaires showed that 13 of the 14 state wildlife agencies who responded to the survey planted deer foods. The survey showed wheat, corn, rye grass, ladino clover, rye and oats were given the highest preference in winter plantings. Preferred summer plantings in the survey were soybeans, peas, alfalfa, reseeding cow peas, and ladino clover.

The choice of what to plant in a feed patch is largely dependent on what will grow well in a particular region and soil. For best results, plant a crop that deer like to eat and that local farmers have grown successfully.

Supplemental plantings can be of value in managing a property for deer; however, they can also be very expensive. The cost of plantings can be significantly reduced by perennial plantings of clover or orchard grass rather than costly row cropping.

Often the manager must be content to create suitable habitat conditions at lower cost by managing native vegeta-



Prescribed burning, when used properly, can increase deer browse substantially, Department staff photo.



The quality of deer, including antler development, is dependent largely upon its habitat, which can be enhanced with the use of modern management techniques; photo by William S. Lea.

tion. Native vegetation is maintained in a variety of productive stages through the use of the bush-hog, the chain saw, a drum chopper, or other mechanical means. Prescribed burning can also be used to maintain and improve habitat for deer.

All forestry and agricultural activities should be conducted under the guidelines of *Best Management Practices*. These are standard, accepted practices outlined in publications of the Virginia Water Control Board. They are guidelines for management practices which reduce soil erosion. An example of a "BMP" that should be followed in regard to timber sales is that the skid roads, log landings, and other openings created by logging should be seeded to a permanent sod. This practice is desirable for soil conservation and as a wildlife management practice, because while protecting the soil from erosion, the grass and other vegetation provides food and cover for wildlife.

From a wildlife perspective, mowing is usually overused on farms throughout Virginia. Too many landowners are not satisfied unless their fields and pastures are as neat as golf courses. As a matter of principle, they mow on an annual basis in an attempt to keep their pastures free of weeds and woody vegetation. To complicate matters further, much of this mowing is either done during nesting season for ground nesting birds such as quail, or during the early fall, which allows no time for regrowth of valuable food and cover prior to winter. In general, habitat can be improved with less mowing.

White-tailed deer habitat improves as open areas containing grasses are invaded by woody vegetation. Abandoned and overgrown fields are prime habitat for deer, since the woody vegetation provides excellent food and cover. The bush-hog can be a valuable tool in maintaining a portion of your property in productive habitat, because, if this cover is left alone, the seedlings grow into saplings, and will no longer be a valuable food source. Manage habitat so that a portion of "abandoned" fields are bush-hogged on an annual basis, so that new prime habitat is constantly growing into prime brushlands.

If mowing is demanded, ground nesting birds can be helped by mowing during the early spring prior to their nesting season.

Options for reclaiming fields that have grown too large to mow include the use of a drum chopper pulled by a dozer, or by bulldozing with a blade. Following drum chopping, the use of prescribed fire can be a useful tool to help kill the saplings to ground level.

Cattle compete directly with deer, since they eat many of the same foods. Thus, the carrying capacity for deer can be increased through the removal or the reduction in number of cattle from the range. Fencing cattle out of a woodlot is also good for a forest.

Coordination of habitat development and timber management can often result in improved deer habitat at low costs. The chain saw is a very valuable tool in habitat management. Through the sale of forest products, diversity in the forest can be increased with small clearcuts or selective cuttings which open up the overstory and increase the amount of deer food near the forest floor. Mature trees are cropped so that second growth vegetation provides food and cover.

Care must be taken to insure that a cutting schedule is developed which insures a balance of harvested areas, as well as the retention of ample mast-producing areas. Generally, a deer's range should have at least 20 percent of its acreage in forests with oaks old enough to produce mast. Of course, larger acreages of acorn production are desirable, especially if your goal is to produce habitat supporting acorn-eating turkey or gray squirrels as well as deer.

Mast production can even be increased through the use of periodic thinning on hardwood stands. By careful selection of the trees to be removed from a forest stand, the future composition can be influenced to consist of the most healthy mast producers through the removal of the smaller, less healthy, or non-mast-producing trees. Thinning in both hardwood and pine stands allows sunlight to reach the forest floor and stimulates the growth of forbs, legumes, and other herbaceous plants. Soft mast producers, such

as dogwood and grape vines, respond to the increased sunlight and growing space. In addition, the stump sprouts from cut hardwoods provide a source of deer browse.

Heavy deer browsing may reduce or even eliminate tree regeneration. The elimination of tree regeneration is a danger sign indicating an overpopulated habitat. If there is a "browse line" (an obvious demarcation on shrubs where the deer are eating below and cannot reach above), then the deer are eating more than the land is producing. The answer to the problem is either reduce the number of deer or increase the carrying capacity or attempt a combination of the two.

The Virginia Game Department's staff of wildlife biologists will help landowners manage wildlife on their properties. They are available to develop a wildlife management plan that will outline habitat improvements designed to complement landowner objectives. Phone or write the Virginia Department of Game and Inland Fisheries, at 4010 West Broad Street, Richmond, VA 23230-1104, 804/257-1000 in order to receive this valuable service.

Habitat management is the key to increasing the abundance of white-tailed deer on your property. Increase the carrying capacity through the development of the proper blend of food and cover, and deer will start making tracks on your land. □

Resource Publications

Cadieux, Charles L. *Wildlife Management on Your Land: A Practical Owner's Manual on How, What, When, and Why*. Stackpole Books; Harrisburg, PA, 1985.

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Jacobson, H.A., Lunceford, C., and Jones, E.J. "Supplemental Food Plantings for Deer in the Southeastern United States." *Wildlife and Sport Fisheries Management*. Mississippi State University and the United States Department of Agriculture Cooperative Extension Service. Publication No.85-2, May 1985.



Trophy Deer

VIRGINIA'S WHITETAILS

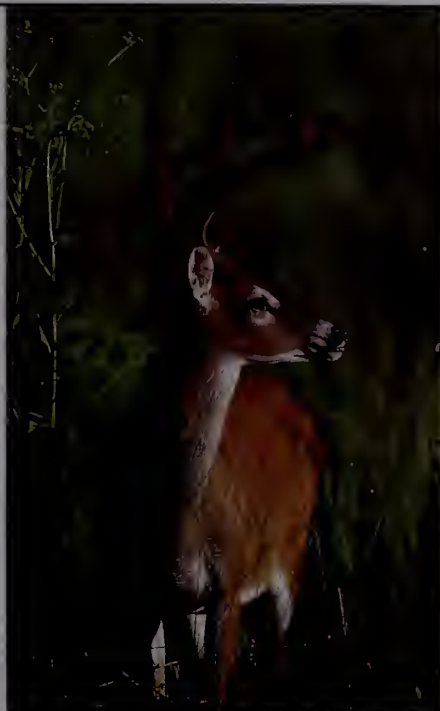
The alarm clock kept buzzing. I peered through one eye at it. One o'clock in the morning. Time for me to roll out if I was to meet Al, Dan, Larry, and Bill at 3:00 a.m. for the final shotgun hunt of the 1986 Radford Army Ammunition Plant (RAAP) deer hunt. A total of five archery hunts and three shotgun hunts had been successfully completed, and 30 hunters would be anxiously awaiting the arrival of the Department of Game and Inland Fisheries personnel so they could have their turn.

In shortly less than two shakes of a lamb's tail, I jumped out of bed, shut off that crazy alarm and crawled in the shower. Finally awake enough to get into a uniform and brave the 20° weather, I climbed into my department vehicle, and started the long drive to RAAP.

The hunters are always waiting for you. Thirty hunters waiting for a big ole buck they have dreamed of for years. At 3:30 a.m., we start to check them in. All the hunters have enough food to last a week, enough clothing for three people and in some cases enough buck lure to float a john boat. Not to mention a set of antlers for rattling up that big buck.

The Radford hunt is much more restrictive than the average deer hunt, but each rule is related to safety and trophy deer management. For example, all hunters are restricted to shooting from their stands.

In the 60's, archery hunting was permitted at the Dublin storage facility, but was discontinued by 1968. Since that time, deer numbers have been controlled by removing deer for translocation to suitable habitat by the Department of Game and Inland Fisheries. In this effort, mostly does



by Mack Walls
Supervising Game Biologist
Southwest Virginia

Opposite: Radford Arsenal Bucks; Game Department staff photo.

were removed. As a result, the number of quality trophy bucks continued to increase.

Today, there no longer exists a need for relocation, and through the cooperation of the commanding officer and other RAAP personnel, the VDGIF designed and currently administers a unique hunting program there. Through a dedicated effort by Alan Guthrie,

Biologist, and Area Supervisors Larry Crane, Bill Keffer, Dan Lovelace, Clarence Stebar, Jim Haulsee, and Dan Morehead, deer stands were constructed and the program was put into practice in 1985.

To date, Radford's best trophy deer have been 5½ to 6½ years of age. However, the first hunt in 1985 resulted in the harvest of 59 deer. Only nine does were taken. If we had continued at that rate, all the big bucks would have been taken within a few years, and not replaced. After all, it takes time for young bucks to develop big racks.

Therefore, we selected a hunt restriction that would result in the taking of an equal number of bucks and does and reduce the pressure put on the bucks. Each hunter is permitted to take any deer prior to 12:00 noon but is allowed only antlerless deer for the remainder of the day's hunt. This regulation reduces the pressure on the buck segment of the population and puts more pressure on the doe portion of the population. It allows the bucks to remain in the population long enough to grow trophy antlers, while regulating deer numbers and sex ratio by removing the does. Our regulations are also designed to remove 75 to 100 deer each season to maintain a healthy deer population.

By restricting the time that antlered deer may be taken and maintaining a 50-50 sex ratio, a number of bucks will become old (5½ years and older) enough to produce quality trophies. Though it will never be possible for every hunter selected to take a trophy buck, most will see a trophy buck (and hopefully it will be before 12:00 noon). The 1986 hunt was conducted under the new regulations and resulted in the taking of 36 antlerless and 37 antlered

deer. The hunt resulted in the desired removal in numbers and approached a 50-50 sex ratio.

In 1985, the success rate for archers was 8% and the gun hunters was 48%. In 1986, however, the archers were not as successful. A total of 15 deer were taken. This is only 6% success for the 250 hunters. The gun hunters bagged 58 deer during their four hunts for a 48% success ratio. The total take in the 1986 hunts was 22 does and 51 bucks.

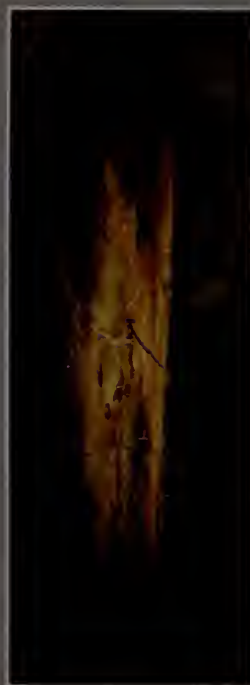
This year's antler development was poor compared to last year because of the drought experienced this past summer (see antlered buck chart). The habitat on the area consists of grasses and some scattered pine plantation. Just remember how few times you had to mow your lawn last summer. The Radford grass suffered too, and as a result, weight and antler growth were much less.

A good indicator of poor antler development is a high proportion of yearling (1½-years-old) bucks that are spikes. The 1985 hunts produced no yearling spikes at all. However, of the deer taken this year, 28% of the yearling bucks were spikes.

Another indicator of herd condition is the weight of the yearling bucks and relative amounts of body fat. By examining each deer harvested, the fat on the kidneys, heart and intestine, we are given a rating which indicates the relative condition of the animal. This year's data indicates lower fat levels and relatively poorer condition in comparison to the 1985 data. As an example, the average weight of the 1½-year-old bucks was 91.3 pounds in 1985. This year, they averaged 90.3 pounds.

The time is now 6:00 a.m. It is cold outside and still dark. We allow the group to decide if they would like to go to their stands now or wait for an additional 30 minutes. They opt for the warmth of the check station for a few minutes longer.

Department personnel are responsible for attending 10 hunters. Each hunter is checked hourly to see if he needs assistance with a deer or if he has wounded a deer. The grass and pine habitat makes finding a blood trail very difficult, especially during the archery



Top: In order to accommodate hunters, the Game Department staff built over 50 deer stands, some with handicapped accessibility, for the trophy hunt at Radford. **Left:** A buck rub this size is typical on the Radford Arsenal property. **Right:** Supervising game biologist Mack Walls shows off one of the typical trophies bagged during the 1985 deer hunt at Radford; Game Department staff photos. **Following pages 18 and 19:** Radford Arsenal is one of the few areas in the state where hunters can witness bucks fighting from their stands; photo by William S. Lea.

Radford Antlered Buck Harvest

Number of points	0	2	3	4	5	6	7	8	9	10	11	12	15	18	Total
1985	4	-	1	1	1	4	2	13	7	13	1	1	1	1	50
1986	10	4	1	2	2	4	4	10	3	2	1	-	-	-	43

hunts.

By the time the last of the hunters are placed on their stands, it's finally time for breakfast. We can keep up with the job as long as we have plenty to eat. Even working Thanksgiving is bearable when Nana Keffer (Bill's wife) appears with a Thanksgiving feast for us all.

We aren't able to rest long, though. A shotgun blast spurs us into action. We will have very little time to relax until dark. A single shot usually means a deer has been taken, but three shots in rapid succession suggest the hooves have carried the trophy away and the hunter is ready to go home. Being limited to three 00 buck shotgun shells 12 gauge or larger, each hunter must leave the plant when his ammunition is spent. The three-shot limit is imposed so that each hunter hopefully will select "good" shots and keep crippling losses to a minimum. So far, so good, for the shotgunners.

The first deer is delivered to the check station at 8:30 a.m., a nice 2½ year-old 8-point buck taken from stand #36. The hunter was grinning like a mule eating briars. With only slight amounts of fat on its internal organs, the buck weighed 161 pounds.

This was just the beginning of the day that resulted in 13 deer (five does and eight bucks) being brought to the check station for examination.

But the deer checked in don't tell the whole story of the hunt. In 1985, 1,396 deer were seen by the 59 hunters who took deer home. That is 24 deer per man. 107 shots were fired with 59 deer taken. The 1986 hunters who took a deer saw 1,650 deer or 23 deer per man, took 122 shots and believed they hit 77 deer.

Of course, many of the hunters told us even more, and some of their stories are simply unbelievable. They talk about this buck with a rocking chair for antlers, that buck with a brush pile

on his head and how they can't believe there are that many *big* bucks out there.

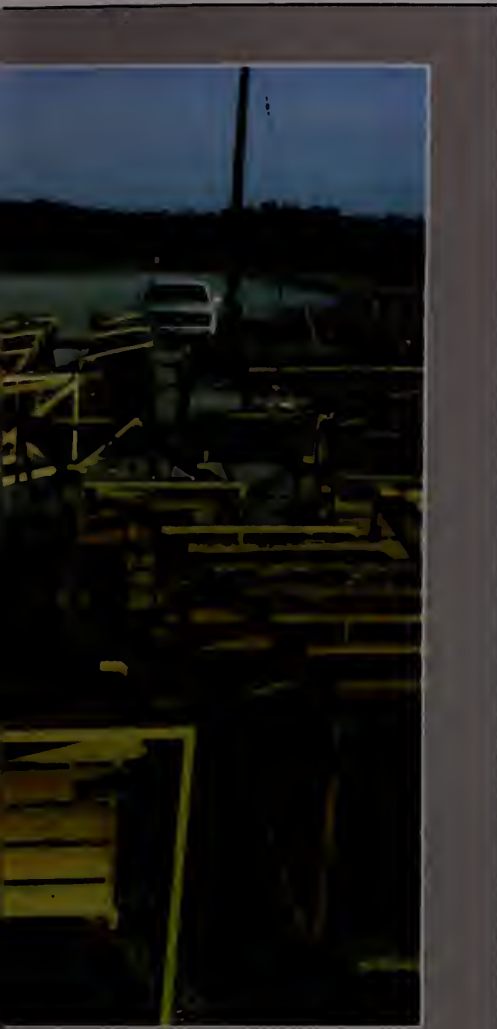
As the day draws to an end, and the last hunters are checked out, they all want to know the size of the biggest deer taken. In 1985, the largest deer taken was a 15-point, 6½-year-old buck weighing 231 pounds. An 18-point, 6½-year-old was also taken by an archer, but weighed 177 pounds.

The deer taken in the 1986 were not as big as the 1985 deer—but they were still nice trophies. The scales were topped by a 10-point, 4½-year-old buck at 181 pounds whole. Also, an 11-point, 4½-year-old buck weighed in at 134 pounds. It is believed that the current regulations will continue to produce deer of this quality.

After reviewing the hunt regulations with the staff and the personnel at RAAP, it was decided to add two additional regulations this year. The first regulation change will require archery hunters to qualify before hunting. The bow hunter must be able to hit a nine-inch paper plate at 20 and at 30 yards with two of three arrows from a stand elevated to a height of 14 feet. Hopefully, this will better prepare the selected archers for hunting on the plant and increase their success. The second regulation change will require selected hunters to sit out a year before being eligible to apply for the RAAP hunt again. This new regulation should give more sportsmen the privilege of hunting at Radford.

As the skies grew dark and the last hunter was checked out, another year of hunting at Radford ended. The last remaining hunter walked over to me, shook my hand and said: "I wasn't lucky enough to take a trophy buck, but it has been the hunt of a lifetime. I just wanted you to know that you're all appreciated for making it possible."

It's amazing how the simplest things can make all the effort seem worthwhile. □









VIRGINIA'S WHITETAILS

The questions seem endless: What should the season length be? What about bag limits? Do we have too many deer? Too few? Are they healthy? And on and on and on. If we don't already know the answers, the questions require research.

Deer research in Virginia is specifically designed to supply data for making management recommendations and decisions. Thus, Virginia has an established system designed to monitor deer herd physical conditions at various check stations, usually located in areas where deer populations are high. The number of check stations varies from year to year. Usually there are 25 to 30 west of the Blue Ridge Mountains, and approximately 10 stations east of the Blue Ridge. The people who collect data at these stations are Department personnel trained to weigh, determine sex and age of the animals, make antler measurements, and examine for any evidence of diseases and external parasites. All stations in Virginia examined 6,871 deer in 1986. This is 5.6 percent of the 1986 harvest of 121,801 deer.

A very interesting thing has been learned from analysis of the trend information derived from check station data. Several years ago, a biologist noticed that when the percent of does in the total harvest reached 35% or above, the total kill in subsequent years began to decline, indicating a reduction in the deer herds. The kill would increase if the percent of does was less than 30 to 35%. This is not always true in every county, but generally speaking, this information helps us to make a decision as to how many "doe days" to recommend for the hunting season.

It must be understood that this rule is not the sole criteria for setting a season. It must be backed up with other



by Joe Coggin
Supervising Wildlife Research
Biologist
Western Region

Opposite: photo by William S. Lea.

information. For example, in our analysis of check station data, we place a great deal of emphasis on the yearling buck (1½ years) segment of the herd.

A high percentage of spikes (50% or more), coupled with low averages of hog-dressed weights of less than 80 pounds and less than 40% fawns in the harvest, would indicate a nutritional problem, possibly too many deer for the amount of food available.

Thus, we also monitor deer habitat from year to year to get some idea on the amount of food available to deer in a particular area. Virginia's system for monitoring the mast crop is to have each wildlife management area supervisor sample the mast production on 80 selected oak trees on his work area. Forty of the trees are sampled in the white oak group and 40 in the black oak group. All trees of mast bearing age located along a road are permanently marked. Twenty more trees in each plot are located on each side of a mountain or hill, and another plot of 20 trees are marked in the valley, to insure a sampling of each altitude and exposure. The mast sample is taken by randomly selecting 10 branches from each tree and counting the acorns on the outer 24" of each branch. Then we calculate the average production of white oaks, black oaks, and combined for each unit, region, and statewide.

This mast crop information is very helpful in understanding some of the deer weights and other measurements. It also helps to analyze data collected on other species such as squirrel production and bear harvest.

Yearly variations in weather also influence our recommendations for hunting seasons. For example, if we have cold, heavy rain or inclement weather on the opening day of the season, and especially during the days at the end of the season when doe deer may be taken, the total kill may drop severely and the percent of does in the

harvest may be altered. Daily weather data is recorded by western biologists and analyzed at the close of the season as it relates to the deer kill in each county.

Sometimes, we run short of personnel or expertise to gather the information we need to make responsible management decisions, especially when we get stumped on an unusual situation, or a special, unexpected condition crops up. For example, Wise County has had a "bucks only" season for years. We know from previous data that reproduction has not been what it should be, and we want to increase the number of deer in that county. Since we were unable to determine the limiting factors to our satisfaction, it was decided to do an intensive research study to determine the nutritional factors influencing deer physiology on the High Knob Wildlife Management Area in the county. The study is funded by the Department of Game and Inland Fisheries, but is contracted to VPI & SU through their Wildlife Unit.

Conducted by graduate student, H.J. Dutton under the direction of Dr. Roy Kirkpatrick, the study involves a thorough analysis of the nutritional status of the deer herd through analysis of soil, vegetation and deer characteristics to see if nutritional factors play a major role in the poor population of High Knob. Data collected on High Knob is being compared with the same data collected on the Stoney Creek Wildlife Management Area in Giles County, which serves as a control for the study. As a result, researchers have concluded that deer on High Knob have been living on a lower nutritional regime than those in many parts of the state, especially during the winter months.

Another study which is being partially funded by the Department of Game and Inland Fisheries, is an intensive investigation into the extent of Lyme disease in Virginia's wildlife. Since humans may become infected with the disease, this research is a high priority for us. Lyme disease is caused by a spirochete, *Borrelia burgdorferi*, which is transmitted by ticks of the genus *Ixodes*, and it is possible that other blood sucking arthropods may



Game Division personnel man a check station to collect biological data on whitetails during hunting season; Game Department staff photo



Game Division personnel are trained in laboratory techniques to collect information that may help them determine the health and quality of a deer herd; Game Department staff photo.



Department biologists use tooth replacement and wear as a proven field technique for aging whitetails, Game Department staff photo.

also transmit this agent. So, Robert Turner, under the direction of Dr. D.E. Sonenshine of Old Dominion University, is conducting a three-year study which is designed to collect sufficient numbers of serum samples and tick specimens from representative Virginia wildlife to evaluate the possibility that Lyme disease is an established disease in this state. The Department will assist with the collection of the blood samples and tick specimens as is needed.

There are other aspects of animal diseases in which pesticide poisoning may play a role. Animals that are suspected of having died or become sick due to pesticide poisoning are taken to the College of Veterinary Medicine at VPI & SU. There they are necropsied to determine cause of death or illness. If the cause is not determined, various tissues are tested for pesticide poisoning. So far, no deer have been shown to

have died from pesticide ingestion.

Deer damage to agricultural crops is another phase of research conducted by the Game Department with the indispensable help of other experts in the field. Every year we keep trying something new or different to repel deer from agricultural crops. We have tried tankage, egg sprays, red pepper spray, bone meal, hinder, lion urine, human hair, and many other concoctions to repel deer. It seems that almost anything will work for a short period of time, but deer adapt well and will eventually continue browsing, especially after a rain washes away repellent sprays. Fences built at a 45° angle will work, but fences are expensive if large areas are to be controlled. Even electric fences with three strands placed 18" apart are expensive for large farms, but our research indicates that damage may be reduced about 95% by this method.

Dr. R.E. Byers of VPI & SU, stationed at the Winchester Fruit Laboratory in Winchester, Virginia is presently doing deer repellent research with Lifebouy soap and other perfumes. He is trying to determine the ingredient in the soap that acts as a repellent to deer. The idea is to develop a reasonably priced spray to use in orchards, and anywhere else where deer damage is a problem. The study shows promise at the present time, and the Department of Game and Inland Fisheries is cooperating with Dr. Byers with a partial funding of the study.

Deer research in Virginia is a cooperative effort, performed by Department staff, universities and other agencies, all with a common goal. Our research is directed towards understanding more about white-tailed deer in Virginia so that we, as the agency responsible for wildlife populations in the state, can better manage them. □



Damage

VIRGINIA'S WHITETAILS

If you are a farmer trying to grow a crop, a homeowner protecting ornamental shrubs, or a motorist driving on one of Virginia's rural roads, an encounter with the whitetail can be costly. With over 120,000 being harvested last year and an estimated statewide population of 600,000, the white-tailed deer is Virginia's number one big game animal. The whitetail also ranks as one of the biggest causes of wildlife related damage to human resources.

Deer can be found in almost every locality in Virginia from Dulles International Airport runways, south to the Dismal Swamp and west till one runs into Tennessee, Kentucky and West Virginia.

But the most common complaint received from the citizens of the state concerning the whitetail usually involves some kind of farmer/deer conflict. The problems that deer can cause a farmer range from browsing on crops, to walking on prepared plant bedding areas, to rubbing trees. The type and extent of damage varies from locality to locality and depends heavily on the overall density of deer within any given location and seasonal factors.

Early nibbling on plants just emerging can have more of an effect on production than browsing occurring later in the age of the plant. Weather is another factor that can affect damage. Extremely dry conditions reduce plant growth, and any browsing by deer will have greater impact on an already stressed crop.

Crop Damage

Row crops account for the majority of complaints received by the Department of Game and Inland Fisheries



by Don Schwab
District Wildlife Biologist
Southeastern Virginia

involving damage by deer. Damage occurs most often in small fields surrounded by woodlands or on the edges of large fields adjacent to wooded cover.

The whitetail browses field crops for basically two reasons: 1) the crop is more attractive to the deer than its natural foods, or 2) the crop is the only available food. Deer prefer vegetation that grows on fertile soils. Since most agricultural crops are heavily fertilized, they are more attractive to the whitetail.

Row crops damaged in Virginia by whitetails include soybeans, alfalfa, peanuts, watermelons and tomatoes, just to mention the yearly regulars. If deer densities are high where these crops are grown, total loss of the crop can occur. However, usually the crops are damaged at much lower levels.

Soybeans are the most commonly damaged row crop in the state, and the Game Division during the 1983, '84 and '85 growing seasons conducted studies that simulated deer browse on this crop. The findings of this three-year study showed that if the plant can get to approximately two weeks of age, browsing of 33-67% of the new growth at weekly intervals had little effect on the production of the plant. If the plant could be protected until it was three to four weeks old, at the same level of browsing, it actually produced *more* beans than the control plants which were totally protected. It was also found that whitetail use of soybean fields was reduced after the plants were five weeks old.

A pilot study related to peanuts which was conducted in the southeastern corner of the state, showed that equipment used to harvest the crop

Opposite: Game Department photo.

can leave more peanuts in the field than the deer damage by either browsing or pawing of the crop. Alfalfa crops on the other hand, are damaged not only by the browsing of the animals, but also by the deer using the fields as bedding areas. When the deer bed down in an area, the vegetation is crushed, and either is broken and dies, or the crown of the plant is too low for the farmer's machinery to fully harvest the crop.

On the Eastern Shore, where produce such as tomatoes, green beans and cucumbers are common crops, the whitetail also causes trouble. Tomato fields are readied for planting by covering the rows with black plastic and fumigating to eliminate nematodes. Deer walk on these plastic-covered rows, puncturing the black covering with their hooves. Why a deer would rather walk on plastic than on the dirt separating the plastic covered rows, especially at a time when the field is devoid of food, has all of us stumped.

Orchard Damage

Some other areas of agriculture that suffer from high deer numbers are orchards and tree farms. Fruit trees less than three years of age that are browsed by deer when most terminal buds of the major branches are available to the animal can result in mortality or reduced production. Dwarf and semi-dwarf fruit trees are extremely susceptible to terminal bud loss, since more branches are within reach of deer for a longer period of time. Whitetails also rub trees, during the hardening of antlers in late summer and early fall when the velvet is being removed from the buck's rack. This rubbing removes the bark of the tree and can kill the tree by girdling, or allow for entrance of diseases that can reduce production or kill the trees. Ripe fruit is also a food that the whitetail can't seem to get enough of. Even when natural foods are plentiful, a deer will go out of its way to browse on and knock down ripe apples, cherries and peaches.

Forest Damage

Though not a common complaint in Virginia, deer do cause some problems with forest production. When damage does occur, it usually is when the animal removes the terminal bud from



Supervising wildlife research biologist Jack Gwynn (far right) and National Zoo employee Linwood Williamson (right) survey a fence designed to keep deer out of an area; Game Department photo.

seedling pines. The loss of this bud results in odd-shaped trees that aren't as marketable for saw timber. Christmas tree plantations are becoming more popular for many Virginians, and whitetail browse damage to these are caused by removing the terminal buds. The result? Deformed Christmas trees with little or no market value.

Collisions

The conflicts/damage discussed to this point occur outside our cities, and are thought of mostly as occurring to the farmer or forester. The whitetail, however, does occur within our cities, and problems usually have something to do with man and deer coming together with a thud.

Dulles International Airport in Northern Virginia has trouble with deer strolling across the runways in front of 200-plus people on a Boeing 747. The deer have to cross the paths of these

planes to reach the nicely mowed and fertilized grass strips separating the various runways and taxiways. In Chesapeake, a whitetail and a small single engine plane had a run-in several years ago. Luckily no one was physically hurt; however, the plane was a total loss and the airport had to spend thousands of dollars placing a deer-proof fence around the airport. Another problem that is common where deer densities are high, is the deer/auto collision. In 1985, Virginia reported 2,108 deer/vehicle collisions resulting in 167 persons injured. These accidents totaled an estimated \$2.1 million in property damage.

Damage Control Techniques

Deer damage is a symptom of overpopulation, but there are techniques available to reduce if not eliminate some forms of damage. Among these are several chemical repellents marketed to keep deer from feeding on crops. Repellents, however, have a tendency to be effective sometimes, and have little or no effect at others. The time of application of the repellent can determine if it will be effective. Some chemicals must be applied prior to deer feeding on the crop, and others can only be applied several weeks prior to harvest, for consumer protection. Whatever the case, the chemicals themselves cost individuals time, fuel, and equipment, and farmers today need to save every cent they can.

Tankage (animal residue from a slaughter house) is less expensive than most chemicals and can be placed along edges of fields, and will keep deer out of fields—sometimes.

Though not economical for row crops (because of expense), orchards, nurseries and airports can be protected from deer damage by deer-proof fences, which can cost as much as \$3.75/ft. and a little as \$0.40/ft.

But, you get what you pay for, as far as protection from deer is concerned. Scare devices, such as propane guns and noise bombs or shells are effective for a while, but like repellents, require time to set up and move as the animals become accustomed to their presence in the fields.

Another method that is used in Virginia are crop damage permits that



Since crop damage by deer is a symptom of overpopulation, the solution lies in regulating deer numbers; photo by William S. Lea.

allow the farmer to shoot the animals during the growing season, if damage can be shown. But, the crop damage permitting system requires the time of Game Department personnel, and the time of the farmer at a period when he has many other things to do. Plus, the permits often cause hard feelings among the people who hunt the animals during the regular season.

In the book *Agriculture and Wildlife Management*, A. Moen states "Wildlife damage control is best accomplished by preventive measures rather than remedial ones." The best method to keep deer damage down to levels that are at least tolerable to the landowner, is through the management of deer populations. To date, the most economical way to manage deer numbers is through sport hunting. Hunting pro-

vides many days of recreation to Virginians, and can also be a way for a farmer to receive a monetary return on hunting rights by leasing his land to sportsmen's groups.

An example of deer management to reduce damage is illustrated in Southampton County. Southampton is always one of the top five deer harvest counties in the state; it also has had some of the highest number of crop damage permits issued, simply because it has too many deer for the area to support.

In the past, 350-450 deer were taken during the summer on crop damage permits. In 1985, however, the total taken on such permits was 200 animals. In 1986 only 49 deer were taken. The population of deer in Southampton County is coming back into bal-

ance with its habitat, not because of the damage permits, but chiefly because of the liberalization of bag limits in the county, and the acceptance of regulations by deer hunters. With an increase in the number of legal deer that can be taken during the season, along with a stipulation that one of the deer taken must be antlerless, the population of deer in the county is approaching a healthy level. The harvesting of does not only helps reduce the number of animals within a population, but helps to improve the quality of the herd in general.

In summary, there will always be some deer damage, but it can be reduced if we Virginians use recognized wildlife management techniques to maintain healthy whitetail populations. □

Deer Herd Health Check

by Jack Gwynn
Supervising Wildlife Research
Eastern Region
Biologist

The Abomasal Parasite Count, (APC) is defined by the Southeastern Cooperative Wildlife Disease Study (SCWDS) as the average number of abomasal parasites from five or more adult deer collected from a specific deer population within one month, preferably during late summer or early fall.

The APC technique was developed by SCWDS, an organization established in 1957 by the Southeastern Association of Fish & Wildlife Agencies, and comprised of wildlife disease specialists. Funded by 13 cooperating southeastern states as well as by the U.S. Fish and Wildlife Service and the Animal and Plant Health Inspection Service, SCWDS is equipped to travel to any area within 48 hours to investigate die-offs of wild animals.

APC History

One of the first jobs tackled by SCWDS was to define the characteristics of a normal healthy deer herd. To accomplish this, SCWDS went to each of the 13 southeastern states, necropsying 10 deer from various kinds of deer range. During a necropsy, SCWDS technicians literally turn a deer inside out to examine every organ and structure. They examined deer from areas with an abundance of nutritious food, and they looked at deer from "browsed out" ranges. It was during these examinations that the number of abomasal stomach worms were observed to vary in relation to the nutritional health of the deer. Fat and healthy deer were found to have few stomach worms, while thin and undernourished deer had many, sometimes extreme numbers of stomach worms.

SCWDS scientists conducted their original research to determine whether APC/deer relationships could be used as an indicator of deer health, and learned that deer that do not get enough to eat are *less resistant* to parasitic infections than well fed animals. If deer numbers exceed the capacity of an area to support them, then their physical condition is reduced and the trans-

mission rate of parasitic worms is increased.

APC Parasite Biology

The parasites have direct life cycles. The adult worms, which live in the abomasum, produce eggs that are passed in the deer's droppings. The eggs rapidly develop into first-stage larvae. These larvae undergo two additional molts and become third-stage infective larvae within one to three weeks. The infective larvae are then eaten by deer along with low growing vegetation and undergo two additional molts within the abomasum before becoming adults. Abomasal parasites, except for a large stomach worm called *Haemonchus contortus*, are relatively harmless and do not typically cause diseases in deer.

How APC's Work

A ruminant stomach, similar to sheep or cattle, has four compartments: 1) the rumen (paunch); 2) the reticulum (honeycomb); 3) the omasum (book); 4) the abomasum (true or gastric stomach). In an APC, only abomasal contents are collected. Abomasums are obtained as soon as possible after death.

A 50 ml sample of abomasum contents is examined under a 7 to 30-power dissecting microscope by pouring small amounts of the sample into a series of gridded petri dishes.

All worms similar in size to adult *Trichostrongylus* (small stomach worms) are removed and counted, and the dish is passed to a co-worker who checks the dish a second time for missed worms.

When to Make APC Collections

Summer deer collections require considerable manpower and are expensive to conduct. In addition, hunters sometimes object to late summer deer

collections. State game departments could save money and have better public relations by doing APC's on hunter-killed deer which are taken during the legal fall season. However, the period of midsummer to early fall is the appropriate time to conduct APC's in the Southeast. Why?

One of the reasons was discovered when Canadian biologists found third stage larvae, eaten by deer during cold weather, molted to fourth stage, but then entered a period of dormancy in the abomasal wall rather than developing into adults. The dormancy ended in the spring when the larvae matured and continued their summer cycle of transmission.

Plus, many deer die-offs that SCWDS and VDGIF biologists have investigated have occurred in the summer. A clue to the reason for this was found when necropsy findings indicated that summer is a difficult time for deer. The necropsies showed deer with little fat stored in the body cavities and bone marrow fat percentages extremely low, indicating poor nutrition.

Late summer, which appears to have bountiful forage, probably has less nutrients to offer deer than appears. Southeastern deer managers seem to be finding that mid- to late summer is a season when the nutritional capacity of the habitat is at a low level.

Summary

Because the quality of deer habitat is ever-changing, as are the number of deer in an area, APC's provide a valuable snapshot of how well a habitat is supporting its population of deer at a particular point in time. If APC's are high, it alerts the wildlife manager that the habitat cannot support its current number of deer and keep them all healthy. It does not necessarily tell us that a place isn't a good one for deer, but it does tell us that there are too many deer for the place to handle. In other words, the food may be good, but there just isn't enough of it for the number of deer trying to share it. □

VIRGINIA'S WHITETAILS

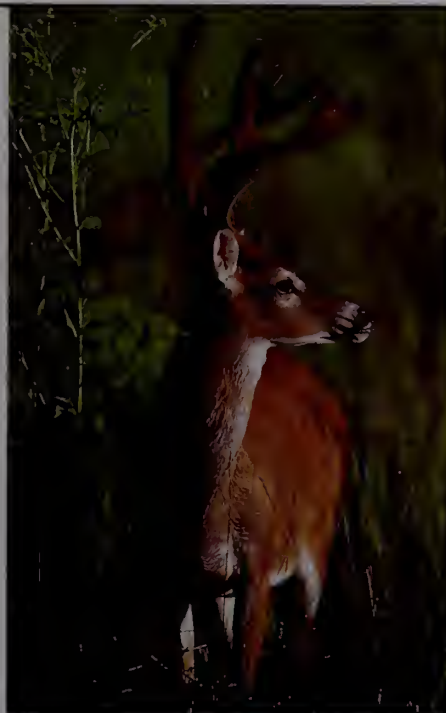
The study of wildlife diseases and parasites is extremely complex. It has been only during recent decades that scientists have successfully isolated and identified many of the microscopic entities that infect wild animals. Although much has been learned about these infectious agents, much remains a mystery.

The white-tailed deer is subject to infection by a wide array of parasites, bacteria and viruses. There are literally hundreds of genera and species of microorganisms and parasites that can infect deer. Many of these infections result in no obvious clinical evidence of disease or sickness. Other infections, however, may cause disease and even death and may quickly spread throughout local populations.

Parasites

Perhaps most familiar among the variety of parasites that infect deer are ticks. Four species that are most commonly encountered on deer in Virginia are the lone-star tick (*Amblyomma americanum*), the wood tick (*Dermacentor albipictus*), and two species of deer tick (*Ixodes dammini* and *I. scapularis*). Heavy infestations of ticks can result in anemia, weight loss, and even death. Infestations are usually much less severe, but still cause stress due to blood loss, secondary skin infections, and disease transmission.

And ticks not only spread disease among deer and other wildlife, but they can transmit disease to humans as well. The public is generally aware of the risk of contracting Rocky Mountain spotted fever from the bite of an infected wood tick. There is an additional threat to humans by a more recently identified bacteria (*Borrelia burgdorferi*) that may be transmitted by the deer tick. The resultant illness



by Jim Bowman
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caused by this bacteria was first identified in Lyme, Connecticut in 1976, and was named Lyme Disease. Like spotted fever, Lyme Disease can have

serious implications, but can be treated successfully with antibiotics if detected early.

Another parasite that sometimes causes alarm when observed by an unsuspecting deer hunter is the larvae of the bot fly (*Cephenomyia* spp.). These occur when the adult fly deposits its small larvae in the nostrils of the deer. The larvae develop in size and migrate into the nasal passages. They are later expelled and molt into an adult fly. These nasal bots apparently pose little threat to the deer and do not impair the quality of the deer flesh for human consumption.

Helminths comprise a large group of internal parasites that also infect white-tailed deer. These include a variety of worm-like creatures, some of which have rather complex life cycles involving other animal hosts for certain stages of development. Otherwise healthy deer usually can tolerate light infestations of these parasites with apparently little or no ill effects. Although some helminth parasites are fairly common in deer, they do not render the meat unsafe for handling or human consumption.

Among the more prominent helminths that are sometimes encountered in Virginia deer are meningeal or brain worms (*Parelaphostrongylus tenuis*), lungworms (*Dictyocaulus* spp.), and liver flukes (*Fascioloides magna*). One study indicated that 73% of deer sampled in seven western Virginia counties were infected with meningeal worms. Although the adult stage of the meningeal worm inhabits the surface of the brain, the lungs are usually the site of development of the first larval stage. It is interesting to note that other North American deer species (ie. mule, deer, elk, moose and caribou) are highly susceptible to infection and

neurological damage by the meningeal worm, while the white-tailed deer is quite tolerant of this parasite.

In the case of lungworms, both larvae and adults are found in the lungs. Although light infestations usually do not cause clinical illness, large numbers of larvae and adults in the lungs may cause pneumonia or other complications.

The liver fluke is so named because it occurs almost exclusively in the liver. These are rather grotesque in appearance, with the liver-colored adults more than two inches in length and somewhat the shape of a flat bean. White-tailed deer are apparently capable of tolerating this parasite, usually with little ill effect. The range of occurrence in Virginia is primarily the lowlands of the coastal plain.

Finally, a review of important deer parasites would not be complete without mentioning stomach worms. This group of tiny nematodes occurs in the fourth chamber, or abomasum, of the deer's ruminant stomach and are harmless when present at levels commonly encountered. During the 1970's, wildlife disease specialists noticed that the abundance of abomasal parasites appeared to be related to deer herd density and herd health status. (See accompanying article.) They found that abomasal parasites were more abundant in deer herds that had grown beyond the ability of their habitat to provide a high quality year-round food supply. This finding led to development of a deer herd evaluation procedure called the Abomasal Parasite Count (APC). Wildlife biologists can use the APC along with other data, such as annual harvest data, to monitor the health status of deer herds. The APC is yet another valuable tool that contributes to our ability to implement sound wildlife management principles in managing Virginia's white-tailed deer.

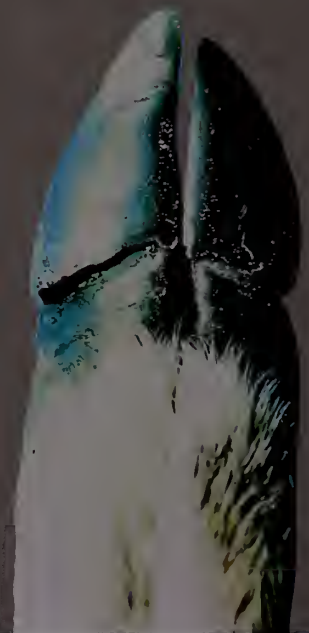
Bacterial and Viral Diseases

A large number of bacteria and viruses are capable of causing disease in deer. Fortunately, most play a relatively minor role. An ongoing study designed to screen samples of blood taken from Virginia deer and other wildlife species indicates that deer are



Skin fibromas in deer is a rather rare physical condition that usually does not cause illness in deer or affect the quality of deer meat; photo by Roy Edwards.

A sloughing hoof is an indication of hemorrhagic disease, an often devastating illness in deer that can reach epidemic proportions in overpopulated deer herds; photo courtesy of SCWDS.



occasionally exposed to diseases such as leptospirosis and tularemia. Both of these bacterial infections apparently cause little or no ill effects in the deer. Other diseases such as rabies, brucellosis, and salmonellosis can result in clinical illness or death but are uncommon in deer in Virginia.

An unusual physical condition of deer, however, that often causes some alarm by observers is the presence of cutaneous, or skin fibromas. Probably occurring in less than two percent of deer, fibromas are virus-induced wart-like growths that are attached to the skin. They usually occur on the head, neck or shoulder region. Fibromas may occasionally grow as large as eight inches in diameter (the size of a very large grapefruit), but are usually smaller. A typical infection may result in a half-dozen growths of small to moderate size, but much greater numbers can occur. Although rather gross in appearance, fibromas usually do not cause clinical illness or otherwise interfere with the deer's activities. In fact, it has been reported that many of the growths eventually regress and slough off. In rare instances the growths may occur in sufficient quantity or size to interfere with vision, breathing, food intake, or mobility. There have been no reported cases of human infection with deer fibroma virus. Furthermore, cutaneous fibromas are attached only to the skin and do not affect the quality of deer meat for human consumption.

Hemorrhagic Disease

Some disease agents do have devastating impacts on Virginia's deer. Reported die-offs among deer in the Southeast have occurred sporadically since the early years of this century. For many years these occurrences were apparently rare and localized geographically, but at that time deer herds also were not widely distributed. As deer herds expanded rapidly during the 1940's and 1950's, reports of die-offs increased in frequency and distribution.

A causative agent of the mysterious deer die-offs was not confirmed until 1955 when about 700 deer, with symptoms similar to earlier cases elsewhere, succumbed in New Jersey. At that time a virus was isolated and

named Epizootic Hemorrhagic Disease Virus (EHD). A very similar and closely related virus, Bluetongue Virus (BT), has also since been identified and produces symptoms in deer virtually identical to EHD. Either collectively or individually, these two viruses cause hemorrhagic disease (HD) in white-tailed deer.

A disease transmitted by biting gnats (*Culicoides spp.*), hemorrhagic disease usually occurs in late summer and early autumn. Conditions are favorable for hatching large numbers of these biting gnats following late summer rains. An HD outbreak may continue until frost eliminates this vector, usually in October.

The disease may manifest itself suddenly and cause death within 24 hours. More often, however, infected deer may live several days before succumbing to HD or other complications. In fact, significant numbers of deer apparently fully recover from the disease. Hemorrhagic disease is characterized by extensive internal hemorrhaging or bleeding of many tissues and organs. Externally, the membranes around the eyes and in the mouth may be inflamed and hemorrhagic, and blood may be visible in feces and urine. The mouth and tongue may be ulcerated and the tongue may be swollen. The disease may be accompanied by a high fever, and infected deer often seek water. Consequently, dead deer are commonly found in or near streams. Tissue damage in the feet may result in sloughing or splitting hooves, a characteristic which is sometimes observed by hunters on "recovered" animals later in the year.

Hemorrhagic disease displays varying degrees of severity and may result in heavy or apparently very low rates of mortality. It does not pose a human health hazard, and properly cooked meat from a "recovered" deer may be safely consumed.

HD may infect wild and domestic ruminants. Cattle, goats and sheep usually do not display clinical signs, and may serve as a reservoir of the virus which periodically reinfects deer populations.

The most recent outbreak of HD in Virginia occurred during the autumn

of 1986, as evidenced by observations of sloughing hooves on hunter-killed deer in 20 eastern counties. The outbreak was widely distributed but moderate in severity, with apparently only light direct mortality. Outbreaks of HD have been documented in Virginia during eight of the 15 years since 1971, and HD is suspected of causing a die-off in 1962. The most recent outbreak which resulted in significant mortality was in 1980, when field surveys indicated that several hundred deer died in the vicinity of Fort Pickett in Nottoway and Dinwiddie counties.

Management Efforts

Because of the widespread distribution and free-ranging characteristic of deer, conventional approaches for prevention or controlling diseases and parasites are not possible. Biologists know that the transfer of infectious diseases and parasites occurs more readily as a deer population increases in density. Also, deer which have an adequate year-round food supply normally are less likely to become diseased than deer that are stressed due to poor nutrition or other factors. Therefore, the most effective means of reducing the problems of disease and parasites in deer is to maintain deer numbers at a level in balance with the available food supply. And, maintenance of proper deer population levels can only be accomplished by setting hunting seasons that promote an adequate annual harvest of both sexes.

Sportsmen, landowners, and other citizens can assist wildlife biologists monitoring disease outbreaks by promptly reporting observations of sick deer or unusual deer mortality. Reports should be made to the Department of Game and Inland Fisheries in Richmond by phoning (804) 257-1000 or by contacting a local Game Department wildlife biologist or game warden.

Note: An excellent comprehensive reference book concerning the subject of this article is entitled *Diseases and Parasites of White-tailed Deer*, edited by William R. Davidson (1981). Copies may be purchased for \$30.00 each from Heritage Printers, Inc. Book Order Department, 510 West Fourth Street, Charlotte, North Carolina 28202. □



Hunter Safety

VIRGINIA'S WHITETAILS

Hunting has become increasingly popular over the years. During the 1986-87 hunting season, 319,574 hunting licenses were sold along with 294,396 big game licenses. In addition, 121,801 deer were harvested by hunters in the Commonwealth.

Unfortunately, increased participation in deer hunting lends itself to problems, including unethical, thoughtless behavior, violation of game laws and, most importantly, unsafe hunting practices. A number of hunters' experiences during the 1986-87 season were not so enjoyable: 79 persons were injured in hunting accidents (13 fatally), and 43 of these injuries, including eight fatalities, occurred while deer hunting.

Safe hunting practices for the deer hunting trip begin before the hunter ever leaves his home. Proper preparation can save lives as well as prevent worry and concern. Be sure to: 1) Let someone know your destination, the name and address of the person(s) with whom you are hunting and your estimated time of arrival at home. 2) Wear the proper clothing (preferably several light layers) suited for wind, rain and cold. 3) Wear blaze orange. It is now required attire for all hunters or anyone accompanying a hunter during the deer firearms season. Each person must wear a blaze orange hat or upper-body clothing (camouflage orange is not acceptable), or display at least 100 square inches of blaze orange within an arm's reach and visible from 360 degrees. 4) Carry a small "emergency pack" containing such items as: matches (in a water-proof container), firestarters, emergency rations, light tarp, flashlight, whistle, compass, knife, nylon cord and a first aid kit. Most importantly, know *how* to use them.



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Opposite: photo by Kevin D. Shank

These items will provide warmth, shelter and energy in an emergency situation. And remember, the universal signal for an emergency is *three* of anything—three gunshots, three light flashes, etc.

Prior to departing the hunting camp, each hunter must agree to follow basic safety rules. Listed below are some *primary* rules of safety—by no means all of them:

1. All hunters should know the

location of the other hunters and agree to remain at their assigned location. Hunters unexpectedly wandering around can cause confusion and accidents.

2. Always treat every firearm as if it were loaded.

3. Always keep the muzzle pointed in a safe direction. Keep the safety on until ready to shoot; but remember: the safety is merely a mechanical device which can fail.

4. Unload guns when not in use; keep actions open and guns cased while traveling.

5. Be sure your gun barrel is clear of obstructions and that you carry ammunition only of the proper size for the gun you are using. Carelessness of this type can cause the barrel to explode, resulting in injury or, in some instances, death.

6. Be sure of your target before you pull the trigger; know identifying features of the game you hunt and *never* make sound shots.

7. Never point a gun at anything you do not intend to shoot; avoid *all* horseplay.

8. Never climb a tree, jump a fence or travel by boat with a loaded gun. Never pull a gun toward you by the muzzle.

9. Never shoot a bullet at a flat, hard surface or at water; be certain of a safe background before attempting to shoot at any game.

10. Avoid alcoholic beverages and other drugs (including some over-the-counter medications) before or during hunting.

11. Take all precautions for a good, clean kill: knowledge of your firearm, distance judging, tracking and proper field care of game.

In addition to safety, the deer hunter



One of the premier rules of hunting safety is to **be sure of your target**; photo by William S. Lea.



Blaze orange is now required clothing during the firearms deer season in Virginia for the safety of youngsters and veteran hunters alike; Game Department photo.

also has the responsibility of obeying the law. These laws exist to protect our rights and also to insure a healthy deer herd for years to come. Ignorance of the law is no excuse.

Anyone who hunts or participates in a hunt is required to purchase a hunting license and carry it with him at all times. Additional licenses and regulations are detailed in the Game Department's hunting regulations brochure and the 1987 Virginia's Hunter's Guide, both available free by writing to the Game Department, Education Division, P.O. Box 11104, Richmond, VA 23230-1104.

And, upon killing a deer, do not forget that you are required to attach a tag from your big game license to the deer before moving it, and, without unnecessary delay, transport the deer to the nearest big-game checking station.

The Virginia Hunter Education Program offers the sportsman an excellent opportunity to become aware of these and other safe hunting practices. Approximately 400,000 students have successfully completed the Virginia Hunter Education course since its inception in 1961, and beginning July 1, 1988, all first-time hunters (be sure to save your old hunting license to prove you have hunted before) and hunters 16 years old and younger will be required to successfully complete a Hunter Education course prior to purchasing a hunting license. The course is a minimum of 10 hours and includes the following subject matter: history of hunting, ethics, laws, knowledge and safe handling of firearms, outdoor skills and survival, archery and bow-hunting, and muzzleloading.

Certification is good for life and honored throughout the United States and Canada. For information regarding courses in your area, contact your local Game and Fish Department Office, or the Richmond office at 804/257-1000.

Safety in deer hunting encompasses much more than a safe shot. No firearms safety rule ever prevented an accident. The hunter must care enough to follow the rules. Make the 1987-88 deer season one which every hunter can return home from with a pleasant memory. □



